UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Ex parte DONALD C.D. CHANG,
WILLIAM W. MAYFIELD,
JOHN I. NOVAK, III,
and FRANK A. TAORMINA

Appeal No. 2006-0406
Application 09/497,865[1]

ON BRIEF

Before KRASS, BARRETT, and MacDONALD, Administrative Patent Judges.

BARRETT, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on appeal under 35 U.S.C. § 134(a) from the final rejection of claims 1-5 and 7-37.

We affirm and enter a new ground of rejection.

[1] Application for patent filed February 4, 2000, entitled "An Improved Phased Array Terminal For Equatorial Satellite Constellations."

BACKGROUND

The invention relates to a low profile tracking phased array antenna for use on a commercial satellite terminal.

Claim 1 is reproduced below.

> 1. An antenna for communication with a satellite, the antenna being for use on a satellite terminal, comprising:
>
> a rotating plate for mechanically scanning for wave signals in the azimuth direction;
>
> a plurality of radiation elements positioned on said rotating plate for electronically scanning for wave signals in elevation, said radiation elements forming respective element signals;
>
> coding circuitry coupling a respective code to a respective one of the element signals to form respective coded element signals;
>
> a multiplexer associated with said plurality of radiation elements for consolidating the coded element signals received at each of said plurality of radiation elements to an analog bit stream;
>
> an analog to digital converter for converting said analog bit stream to a digital bit stream;
>
> circuitry for forming multiple digital beams corresponding to respective coded element signals from said digital bit stream; and
>
> a digital receiver determining signal strengths for the coded element signals and locking onto a strongest signal having a corresponding element, so that the corresponding element can be used for transmission.

THE REFERENCES

The examiner relies on the following references:

Ajioka	3,720,953	March 13, 1973
Chang et al. (Chang)	5,077,562	December 31, 1991
Aoki et al. (Aoki)	5,257,030	October 26, 1993
Barrett et al. (Barrett)	5,973,647	October 26, 1999
Karlsson et al. (Karlsson)	6,034,634	March 7, 2000 (filed October 24, 1997)

Isamu Chiba et al. (Chiba), Digital Beam Forming (DBF) Antenna System for Mobile Communications, IEEE AES Systems Magazine, September 1997, pp. 31-41.

THE REJECTIONS

Claims 1, 4, 5, 7-9, 11, 13-18, 21, 22, and 25-37 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Karlsson, Chiba, Chang, and Aoki.

Claims 2, 3, 10, 12, 19, 20, 23, and 24 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Karlsson, Chiba, Chang, and Aoki, further in view of Ajioka and Barrett.

We refer to the final rejection (pages referred to as "FR__") and the examiner's answer (pages referred to as "EA__") for a statement of the examiner's rejection, and to the brief (pages referred to as "Br__") and reply brief (pages referred to as "RBr__") for a statement of appellants' arguments thereagainst.

DISCUSSION

New ground of rejection under 37 CFR § 41.50(b)

Claims 7-12 are rejected under 35 U.S.C. § 112, second paragraph, as indefinite for being functional. The wherein clause "wherein the antenna is able to lock onto a second equatorial satellite in the constellation before handing over from a first equatorial satellite" in claim 7 is functional because we do not find any structure or "means" in the claim to perform the function. A "wherein" clause is like a "whereby" clause. A "whereby clause" is used (1) to indicate that the structure or elements previously enumerated will necessarily give the result which follows the term "whereby," in which case no further structural limitations are implied, or (2) where it is desired to imply that certain forms of structure set forth will give the desired result, other forms will not, and that the claim is intended to cover only such forms as will give the desired result, in which case structural limitations to the enumerated structure are implied. However, here it is not clear what structure in the claim performs the recited function.

Grouping of claims

Appellants argue that the claims are separately patentable (Br3). Nevertheless, the regulations in effect at the time the brief was filed required that an argument be provided why the claim is separately patentable and that merely pointing out

differences in what the claims cover is not a separate argument for patentability. See 37 CFR § 1.192(c)(7). Appellants have not separately argued independent claims 21, 30, or 37 and these claims should stand or fall together with claim 1. As to independent claims 7 and 13, appellants state that these claims are allowable for the reasons set forth with respect to claim 1 (Br7) and, thus, they normally would be treated as standing or falling together with claim 1. However, because of a claim interpretation issue, we group claims 1, 7, 21, and 37 in one group and claims 13 and 30 in another group.

The arguments as to the dependent claims are generally of the form of describing what the claim recites and then stating that the cited references do not teach or suggest this limitation "in association with the recitations of [the claim from which it depends]." This seems to be a denial that the references teach the feature of the dependent claim. However, appellants do not address the teachings of the references. The dependent claims will be briefly addressed.

Claims 1, 4, 5, 7-9, 11, 13-18, 21, 22, and 25-37

The examiner finds that Karlsson discloses an antenna mounted for scanning in the azimuth and elevation direction, but does not disclose the circuitry (FR2). The examiner finds that Chiba teaches the advantages of digital beam forming (DBF) (FR2). The examiner finds that Chang describes a specific DBF technique

which includes the claimed multiplexer, analog to digital converter, and circuitry for forming multiple digital beams and that a digital receiver would be inherent (FR3). The examiner finds that Aoki teaches digital processing which automatically transmits beams in the direction of the arriving beam (FR2). The examiner concludes that it would have been obvious to modify Karlsson to use a DBF to achieve the advantages taught by Chiba, to use the specific DBF technique of Chang, and to process a transmission signal in the direction of the received signal in view of the retrodirectivity teachings of Aoki (FR3).

Karlsson discloses a phased array antenna mounted on top of an elevation table which is mounted to an azimuth turntable. The antenna can be scanned both by mechanically rotating the azimuth table and moving the elevation table and by electronic scanning of the antenna elements by changing their relative phase relationship (col. 6, lines 37-43). Normally the boresight of the antenna is pointed at the satellite with which it is in communication (col. 7, lines 2-6). During handoff from one satellite to another, the boresight of the antenna is physically scanned to a positioning vector intermediate the vectors defining the respective positions of the coming and going satellites (col. 7, lines 32-35) and then the antenna is electronically scanned to move the antenna beam from the going satellite to the coming satellite (col. 7,, lines 52-63) which results in

instantaneous switch over between satellites with virtually no loss in data (col. 8, lines 14-17). Karlsson is relied upon to show a plurality of radiation elements mounted on a plate which can be rotated in the azimuth direction. The fact that the plane of the elements can be tilted in elevation is not precluded by the claims. Karlsson does not disclose the details of the circuitry, as noted by appellants (Br4-5). The examiner relies on the other references for the circuitry features.

Chiba discloses a DBF antenna where the microwave signal is converted into a digital signal. "Beam-forming is carried out in a digital processor, so both excitation amplitudes and phases can be controlled more precisely in the DBF than in the conventional phased array antenna." (P. 31.) Chiba states (p. 32):

> DBF is able to form multiple beams simultaneously with parallel processing. By covering over the required region with these beams and selecting the beam with the maximum receiving power, the arriving signal can be received automatically. Then, in a mobile satellite communication, the satellite signal is captured and the automatic coarse tracking to the arriving signal is achieved by simply having the beam of maximum power be selected out of the multi-beams without any other assistance, as microwave phase shifters or direction finding sensors. [Emphasis added.]

Chiba shows the test DBF antenna mounted on a van (Fig. 9) and, it appears, on a fixed disk on the roof of the van. Chiba discloses that as the van is turned "[t]he selected strongest beam was automatically switched from one beam to another" (p. 35, referring to Fig. 10). Chiba discloses that the DBR antenna consists of 16 element antennas (p. 32) and forms 16 digital

beams using two-dimensional FFT from which comparators are used to select the four strongest beams which are adaptively processed and weighted to produce a single output signal (pp. 37-38; Fig. 14). Thus, Chiba discloses "circuitry for forming multiple digital beams," as recited in claim 1, but Chiba uses parallel processing and, thus, does not have "coded element signals" or a "digital bit stream" (a serial stream). Chiba teaches the advantages of DBF and teaches selecting the strongest four beams and we agree with the examiner that Chiba would have suggested using DBF for the circuitry in the azimuth mounted antenna in Karlsson. The fact that Chiba appears to show the antenna mounted horizontally on the roof of the van is further suggestion to combine. It would have been obvious to one of ordinary skill in the art to select a single strongest signal instead of four and Chiba discloses "selecting the beam with the maximum receiving power" (p. 32). However, Chiba discusses only satellite signal reception (e.g., p. 39) and not transmission. Appellants argue that Chiba fails to teach retrodirectivity (Br5) and this is true since it does not teach transmission. Although it seems that the strongest signals would be used to determine the elements for transmission since real satellite communication systems do more than receive, this is not taught and we do not have sufficient evidence of knowledge of those of ordinary skill in the art to make such a finding.

Chang, which shares one of the co-inventors of the present application, is mentioned by appellants at page 11 of the specification and is assigned to the real party in interest of this application. Chang discloses a circuit in Fig. 2 which corresponds to Figs. 4 and 5 of appellants, except that the output of the DBF 130 is not sent to code generators 58 and a multiplexer 60 and a digital receiver 64 as in Fig. 5; however, these differences in circuitry are not claimed. The low noise amplifier 142 in Chang have a low noise amplifier and a band pass filter (BPF) corresponding to elements 38 and 40 in Fig. 4, and the decoder 202 contains matched filters corresponding (col. 6, lines 35-37) to the match filters 52 in Fig. 5, although band pass filters and matched filters are not claimed. There appears to be no dispute that Chang teaches the "multiplexer," "analog to digital converter," "circuitry for forming multiple digital beams corresponding to respective coded element signals from said digital bit stream." Appellants do not dispute the examiner's finding that the one or more output beams B inherently go to a digital receiver. Appellants argue that Chang does not teach the use of coding for retrodirectivity, i.e., the strongest signal is not determined so that a transmitting beam may be transmitted using the same element (Br5). Chang does not expressly disclose selecting a strongest signal, but, given the teachings in Chiba, we find that one of ordinary skill in the art would have known to

select the strongest beam signal. Chiba does not disclose using the element corresponding to the strongest signal for transmission. Since Chang shares one of the co-inventors of the present application and is assigned to the real party in interest in this case, we assume that appellants would inform the Office if one skilled in the art would have recognized that the circuit was intended to be used to provide retrodirectivity.

We agree with the examiner that it would have been obvious to combine an azimuth scanned antenna as taught by Karlsson with the specific DBF circuit taught by Chang given the teachings of the advantages of using DBF and mounting an antenna array flat on the top of a van in Chiba. Chiba also discloses "locking onto a strongest signal having a corresponding element" (claim 1 and similar limitations in all independent claims) which suggests that the circuit in Chang would determine the strongest signal.

The main issue is the interpretation of the limitations "a digital receiver determining signal strengths for the coded element signals and locking onto a strongest signal having a corresponding element, so that the corresponding element can be used for transmission" (claim 1 and similar limitations in claims 7, 21, and 37) and "determining signal strengths for the coded element signals and determining a strongest signal of the signal strengths and a corresponding element, and transmitting a transmit beam using the corresponding element" (claim 13 and a

similar limitations in claim 30) and whether these limitations are taught by Aoki. We noted in the preceding paragraph that Chiba discloses locking onto a strongest signal in a DBF circuit to determine where the signal is coming from. Appellants argue that Karlsson and Chiba fail to teach the retrodirective aspect of the claims and that Chang teaches coding, but does not teach the use of coding for retrodirectivity (Br5). "Retrodirective" refers to transmitting a signal back in the direction from which a signal is coming. Appellants admit that Aoki teaches a retrodirective antenna, but argue (Br6):

> The *Aoki* reference also fails to teach or suggest determining a strongest signal from an element and locking on to the strongest signal having a corresponding element, so that the corresponding element can be used for transmission. That is, the *Aoki* reference appears to teach using each of the elements to determine the direction of the incoming signal and transmits the transmitted signals using the corresponding elements. The *Aoki* reference also fails to teach the coding circuitry.

It is argued that none of the references teach or suggest a digital receiver determining a strongest signal from a coded element signal and locking on to the strongest signal having a corresponding element (RBr2-3). It is argued that Aoki uses a completely different method for determining the direction (RBr4).

The examiner provides the following interpretation (EA6):

> The further addition of the teachings of Aoki et al make obvious the retrodirective properties desired in a communication system so as to direct the transmission in the same direction as the arrival direction of a signal. The claim language "so that the corresponding element can be used for transmission" is met on several levels. Firstly,

> each or all of the elements *can be used* for transmission, thus the language fails to provide any distinguishing feature since any/all corresponding element(s) including the element receiving the strongest signal can be used for transmission and would be used in the event that all of the elements are generating the transmission beam. Secondly, the combination of references suggests determining the direction of arrival of all signals, including the strongest signal. The element receiving the strongest signal obviously would be part of the elements transmitting back in the same direction as the received direction.

Appellants admit that the claim phrase "so that the corresponding element can be used for transmission" would include a system that uses all elements for transmission, but that Aoki does not teach a digital receiver determining signal strengths for the coded element signals and locking on to a strongest signal having a corresponding element since it uses phase differences rather than the strongest signal (RBr4).

Everyone is in agreement that the phrase "so that the corresponding element can be used for transmission" does not preclude using all elements, including the "corresponding element," for transmission. Appellants' drawings do not show the transmitter arrangement and it is not clear to us from the description of the transmitter at page 15 of the specification whether appellants are actually using all elements or whether appellants use only one element and merely concede that the claims do not preclude using more than one element. It is disclosed (page 14): "The transmit signal will be directed to the same antenna beam position from where the received signal

originated. The transmit beam can then be steered by a phase conjunction mechanism." What is important is that the transmit beam is directed to the direction from which the input signal is coming, not that only a single element is used. Retrodirective antennas such as Aoki use all of the elements for transmit and it is not clear whether appellants are using the same arrangement. We assume this matter can be clarified without adding new matter.

More importantly, however, we interpret the phrase "so that the corresponding element can be used for transmission" to be a statement of intended use which is not entitled to patentable weight since it says that the corresponding element "can be used for transmission" (emphasis added) and no actual transmission is required. The manner or method in which a machine is to be utilized is not germane to the issue of patentability of the machine itself. See In re Casey, 370 F.2d 576, 580, 152 USPQ 235, 238 (CCPA 1967). The same comment applies to claims 7, 21, and 37. The phrase "to provide for retrodirectivity" in claim 8 is also considered a statement of intended use. As long as a strongest signal is determined and the corresponding element "can be used" for transmission (as well as other elements) or to provide for retrodirectivity, the limitation is satisfied. Since Chiba discloses locking on the strongest signal, and the corresponding element is capable of being used for transmission, Aoki is not required for claims 1,

7, 21, and 37. Because these claims stand or fall together, the rejection of claims 1, 7, 21, and 37 is affirmed.

Although we interpret that claims 1, 7, 21, and 37 do not require transmitting a transmit beam, we agree with the examiner that Aoki teaches a transmitting a transmit beam using the element corresponding to the strongest signal. Aoki teaches a retrodirective antenna wherein a Fast Fourier Transform (FFT) circuit 18 computes the intensity of the incoming radio waves in every direction (col. 4, line 59, to col. 5, line 9) and the direction of the incoming radio wave is detected by circuit 19 from the intensities of the incoming waves (col. 5, lines 10-15) and a control signal computes an amount of control for the phases of the transmitted radio waves to have them correspond to the direction of arrival (col. 5, line 15, to col. 6, line 7). Thus, the control signal determined from the strongest signal of the elements is used to control transmission of a signal back in the direction from which the signal is coming. Appellants agree that some retrodirectivity aspect is provided in Aoki (RBr2). However, it is argued, the system shown in Fig. 2 operates in a different way and provides circuitry for each of the respective antenna elements, which is an inefficient use of resources due to the amount of redundant circuitry (RBr3). It is not known whether appellants are arguing that there is receiving circuitry for each element or transmitting circuitry for each element.

Chang discloses coding and multiplexing to avoid redundant receiving circuitry. Since appellants do not illustrate their transmit circuitry, we have no idea what it looks like and it cannot be used to distinguish over Aoki. It is argued that Aoki does not teach a digital receiver that determines signal strengths for the coded element signals and locks onto a strongest signal having a corresponding element so that the corresponding element can be used for transmission (Br6; RBr3). Aoki discloses receiving and processing digital signals (Fig. 3) and determines the maximum intensity of the incoming signals to form a control signal for retrodirectivity (col. 5, line 10 to col. 6, line 7) which is locking onto a strongest signal or, at least, appellants have not said why not. It has been noted that the claims do not preclude using all elements for transmission including the element corresponding to the strongest signal. It is argued that Aoki appears to be directed to a stationary system and, thus, there is no teaching for use with a rotating plate and an element (Br6; RBr3). Karlsson is used to teach associating an antenna with a rotating plate for a mobile station (cols. 1 & 2). It is not apparent why Aoki does not use an element corresponding to the element having the strongest signal (as well as other elements) for transmission. Therefore, the rejection of claims 1, 7, 21, and 37 is affirmed even if the limitation "so

that the corresponding element can be used for transmission" requires transmission instead of the intended use.

Claim 13 recites a step of "transmitting a transmit beam using the corresponding element" and claim 30 recites a step of "transmitting a transmit beam ... using the corresponding waveguide," which positively recite a transmission step. Again the claims do not preclude transmitting using all of the radiation elements. For the reasons stated in the preceding paragraph, we conclude that transmission using the element corresponding to the strongest signal is taught by Aoki. The rejection of claims 13 and 30 is affirmed.

Appellants argue that the cited references do not teach or suggest the limitations of the particular dependent claim "in association with the recitations of [the claim from which it depends]." It is not apparent from this argument structure whether appellants are relying on the patentability of the claim from which the particular claim depends or are arguing that the additional feature of the dependent claim is not taught. We find that features of the dependent claims are taught by the references. For example, appellants argue (Br6):

> Claim 4 is also believed to be independently patentable since claim 4 requires that the circuitry for forming multiple digital beams does so through FFT techniques. The cited references do not teach or suggest this in association with the recitations of claim 1.

However, Chiba, Chang, and Aoki all teach forming multiple beams using FFT techniques. Appellants argue (Br6):

> Claim 5 is also believed to be independently patentable since claim 5 requires that the antenna may be utilized on a mobile vehicle. The cited references do not teach or suggest this in association with the recitations of claim 1.

However, Karlsson is directed to an antenna for a mobile station (cols. 1 & 2), which is a mobile vehicle, and Chiba also discloses mounting the antenna on a mobile vehicle, a van. Similar observations are made with respect to the remainder of the claims. It must be assumed that appellants are relying on the patentability of the parent claims or the arguments would be misleading. We agree with the examiner's response (EA7-8) that appellants have failed to show why the prior art in combination does not meet the claim limitations. The rejection of dependent claims 4, 5, 8, 9, 11, 14-18, 22, 25-29, and 31-36 is affirmed.

Claims 2, 3, 10, 12, 19, 20, 23, and 24

We agree with the examiner's response (EA8) that appellants have failed to show why Ajioka and Barrett do not meet the limitations of these dependent claims. The rejection of dependent claims 2, 3, 10, 12, 19, 20, 23, and 24 is affirmed.

CONCLUSION

The rejections of claims 1-5 and 7-37 are affirmed.

A new ground of rejection of claims 7-12 under 35 U.S.C. § 112, second paragraph, is entered pursuant to 37 CFR § 41.50(b).

This decision contains new grounds of rejection pursuant to 37 CFR § 41.50(b) (2004). 37 CFR § 41.50(b) provides "[a] new ground of rejection pursuant to this paragraph shall not be considered final for judicial review."

37 CFR § 41.50(b) also provides that the appellant, WITHIN TWO MONTHS FROM THE DATE OF THE DECISION, must exercise one of the following two options with respect to the new ground of rejection to avoid termination of the appeal as to the rejected claims:

> (1) Reopen prosecution. Submit an appropriate amendment of the claims so rejected or new evidence relating to the claims so rejected, or both, and have the matter reconsidered by the examiner, in which event the proceeding will be remanded to the examiner. . . .
>
> (2) Request rehearing. Request that the proceeding be reheard under § 41.52 by the Board upon the same record. . . .

No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a)(1). See 37 CFR § 1.136(a)(1)(iv) (2004).

AFFIRMED - 37 CFR § 41.50(b)

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